5) Density $f(t) = \lambda e^{-\lambda t}$ what is $f_{x+y}(t)$?

$$f_{x+y}(z) = \int_0^z f_x(x) \cdot f_y(z-x)\,dx$$

$$= \int_0^z \lambda e^{-\lambda x} \cdot \lambda e^{-\lambda(z-x)}\,dx$$

$$= \lambda^2 e^{-\lambda z} \int_0^z e^0\,dx \Rightarrow \lambda^2 e^{-\lambda z} \int_0^z dx$$

$$= \lambda^2 e^{-\lambda z}\Big|_0^z = \boxed{z\lambda^2 e^{-\lambda z}}$$